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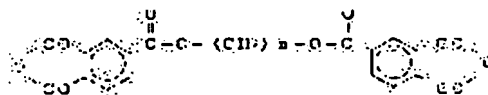
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## (54) ADHESIVE FILM, ITS PRODUCTION, AND METHOD FOR ADHESION

## (57)Abstract:

PURPOSE: To prepare an adhesive film for die bonding which, like a conventional silver paste, enables the heat treatment in die bonding to be carried out at a relatively low temp.

CONSTITUTION: This adhesive film contains 100 pts.wt. polyimide resin obtd. by reacting a diamine with a tetracarboxylic dianhydride component contg. at least 70mol% tetracarboxylic dianhydride of the formula (wherein (n) is an integer of 2-20), 1-200 pts.wt. epoxy resin, 0.02-240 pts.wt. phenol resin, 0.0001-100 pts.wt. cure accelerator, and 50-4,000 pts.wt. inorg. filler.



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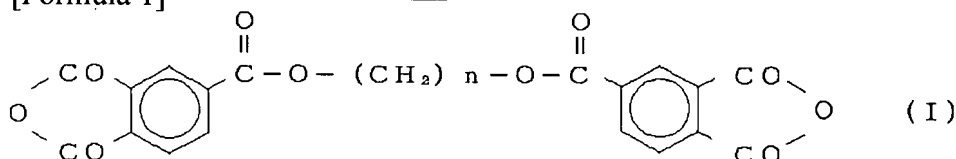
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## CLAIMS

[Claim(s)]

[Claim 1] (A) Next \*\* 1 [a formula (I)]

[Formula 1]



(-- however, the integer of  $n=2-20$  is shown. ) -- the tetracarboxylic dianhydride expressed -- all acid 2 anhydride -- receiving -- more than 70 mol % -- polyimide system resin; which diamine is made to react to the tetracarboxylic dianhydride contained, and is obtained

(B) Epoxy resin;

(C) Phenol resin;

(D) The adhesive film which comes to contain hardening-accelerator; and (E) mineral matter filler.

[Claim 2] (A) the tetracarboxylic dianhydride expressed with a formula (I) -- all acid 2 anhydride -- receiving -- more than 70 mol % -- the manufacturing method of the adhesive film of claim 1 characterized by to heat after dissolving polyimide system resin (B) epoxy resin; and (C) phenol-resin; which diamine is made to react to the tetracarboxylic dianhydride contained, and are obtained in an organic solvent, adding (D) hardening-accelerator; and (E) mineral-matter filler to this, mixing and applying on a base film.

[Claim 3] The method of pasting up the semiconductor device and supporter material which sandwich the adhesive film of claim 1 between a semiconductor device and supporter material, and are characterized by carrying out heating sticking by pressure.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the adhesive film used as the cementing material of die bonding material of IC, LSI, and a leadframe, i.e., a charge, its manufacturing method, and the pasting-up method.

[0002]

[Description of the Prior Art] Conventionally, an Au-Si eutectic alloy, solder, or a silver paste is used for junction of IC, LSI, and a leadframe. Although thermal resistance and moisture resistance are high, an Au-Si eutectic alloy tends to break, when it applies to a large-sized chip, since the modulus of elasticity is large, and also has an expensive difficulty. Although solder is cheap, thermal resistance is inferior, and a modulus of elasticity is high like an Au-Si eutectic alloy, and still more difficult to apply to a large-sized chip. On the other hand, a modulus of elasticity is also the lowest in the three above-mentioned person, and since it also has thermal resistance applicable to a 350-degree C thermocompression bonding mold wire bonder, the charge of junction material of current IC and LSI, and a leadframe is in use [ a silver paste is cheap, and / moisture resistance is high, and ]. However, when it is going to join a leadframe to IC or LSI with a silver paste while high integration of IC or LSI progresses in recent years and the chip is enlarged in connection with it, difficulty is followed on opening a silver paste all over a chip and applying.

[0003] micro electro nick Manufacture ring and -- The adhesive film for die bond which filled up thermoplastics with filler metal at testing (MICROELECTRONIC MANUFACTURING AND TESTING June, 1988, 9 pages) was indicated. To near the melting point of thermoplastics, this raises temperature and carries out pressurization junction.

[0004]

[Problem(s) to be Solved by the Invention] If thermoplastics with the low melting point is used for the adhesive film indicated by the above-mentioned magazine, the damage given to chips, such as oxidization of a leadframe, by becoming low will have little virtual junction temperature, and it will end. However, since thermal resistance is low, heat treatment after die bond, for example, wire bond, a closure process, etc. cannot be borne. When thermoplastics with the high melting point is used so that it can be equal to such heat treatment, virtual junction temperature becomes high and there is a problem which receives damages, such as oxidization of a leadframe. This invention aims at offering the adhesive film for die BONTTO which can perform comparatively heat treatment at the time of die bond at low temperature like the conventional silver paste.

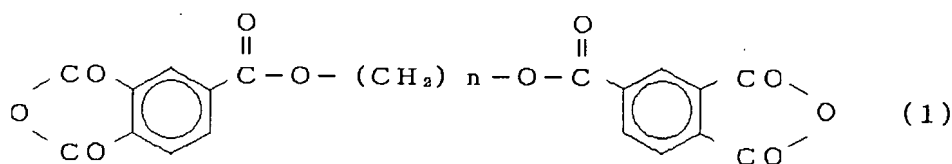
[0005]

[Means for Solving the Problem] This invention relates to following (1) - (3).

(1)

(A) Next \*\* 2 [a formula (I)]

[Formula 2]



(-- however, the integer of  $n=2-20$  is shown.) -- the tetracarboxylic dianhydride expressed -- all acid 2 anhydride -- receiving -- more than 70 mol % -- polyimide system resin; which diamine is made to react to the tetracarboxylic dianhydride contained, and is obtained

(B) Epoxy resin;

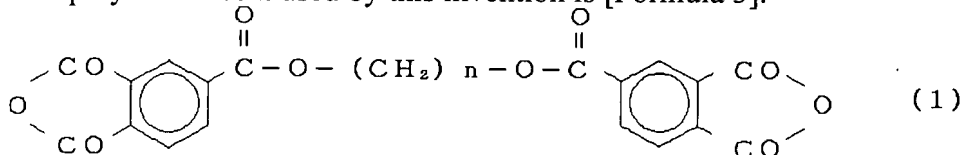
(C) Phenol resin;

(D) The adhesive film which comes to contain hardening-accelerator; and (E) mineral matter filler.

(2) -- the tetracarboxylic dianhydride expressed with the (A) type (I) -- all acid 2 anhydride -- receiving -- more than 70 mol % -- to the tetracarboxylic dianhydride contained Polyimide system resin and (B) epoxy resin; and (C) phenol resin; which diamine is made to react and are obtained are dissolved in an organic solvent. The manufacturing method of the adhesive film characterized by heating after adding (D) hardening-accelerator; and (E) mineral matter filler to this, mixing and applying on a base film.

(3) The method of pasting up the semiconductor device and supporter material which sandwich the adhesive film of the above (1) between a semiconductor device and supporter material, and carry out heating sticking by pressure.

The polyimide resin used by this invention is [Formula 3].



(-- however, the integer of  $n=2-20$  is shown.) -- the tetracarboxylic dianhydride expressed -- all acid 2 anhydride -- receiving -- more than 70 mol % -- polyimide system resin \*\* which diamine is made to react to the tetracarboxylic dianhydride contained, and is obtained is used.

[0006] As for the epoxy resin (B) used by this invention, the epoxy resin of the glycidyl ether mold of a phenol is preferably used for intramolecular from the point of hardenability or a hardened material property including at least two epoxy groups. As such resin, bisphenol A, bisphenol A D, Bisphenol S, Bisphenol F or the condensate of halogenation bisphenol A and epichlorohydrin, the glycidyl ether of phenol novolak resin, the glycidyl ether of cresol novolak resin, the glycidyl ether of bisphenol A novolak resin, etc. are mentioned. the amount of an epoxy resin -- the polyimide resin 100 weight section -- receiving -- the 1 - 200 weight section -- if preferably fewer in the range of the 5 - 100 weight section than this, an adhesive property will worsen, and a film plasticity is inferior when many.

[0007] The phenol resin (C) used by this invention has at least two phenolic hydroxyl groups in a molecule, and for example, phenol novolak resin, cresol novolak resin, bisphenol A novolak resin, a Polly p-vinyl phenol, phenol aralkyl resin, etc. are mentioned as such resin. the amount of phenol resin - the epoxy resin 100 weight section -- receiving -- the 2 - 150 weight section -- it is the range of the 50 - 120 weight section preferably, and even if [ than this ] more, hardenability becomes inadequate at least.

[0008] If the hardening accelerator (D) used by this invention is used in order to stiffen an epoxy resin, especially a limit will not have it. As such a thing, imidazole-derivatives, dicyandiamide derivative, dicarboxylic acid dihydrazide, triphenyl phosphine, tetra-phenyl phosphonium tetraphenylborate, 2-ethyl-4-methylimidazole-tetraphenyl borate, 1, and 8-diazabicyclo (5, 4, 0) undecene-7-tetraphenyl borate etc. is used. These may use two or more sorts together. the amount of a hardening accelerator - the epoxy resin 100 weight section -- receiving -- 0.01 - 50 weight section -- it is the range of 0.1 - 20 weight section preferably, if fewer than this, hardenability will become inadequate, and if many, preservation stability will worsen.

[0009] it is added in order to give low-fever expansibility and low moisture absorption to adhesives, and

the mineral matter filler (E) used by this invention is independent in inorganic insulators, such as a silica, an alumina, a titania, glass, an iron oxide, and a ceramic, -- or two or more sorts are mixed and it uses. the amount of a mineral matter filler -- the polyimide resin 100 weight section -- receiving -- the 1 - 8000 weight section -- it is the range of the 50 - 4000 weight section preferably. If fewer than this, sufficient low-temperature expansibility and low hygroscopicity will not be acquired, but if [ than this ] more, an adhesive property will fall.

[0010] As tetracarboxylic dianhydride which is used by this invention and which is expressed with a formula (I) Ethylene screw trimellitate 2 anhydride, trimethylene screw trimellitate 2 anhydride, Tetramethylenebis trimellitate 2 anhydride, pentamethylene screw trimellitate 2 anhydride, Hexamethylenebis trimellitate 2 anhydride, hepta-methylenebis trimellitate 2 anhydride, Octamethylene screw trimellitate 2 anhydride, nonamethylene screw trimellitate 2 anhydride, There are deca methylenebis trimellitate 2 anhydride, dodeca methylenebis trimellitate 2 anhydride, hexadecamethylene screw trimellitate 2 anhydride, OKUTA deca methylenebis trimellitate 2 anhydride, etc., and two or more sorts may be used together.

[0011] These tetracarboxylic dianhydride is compoundable from trimellitic anhydride mono-chloride and corresponding diol. The above-mentioned tetracarboxylic dianhydride contains more than 70 mol % to all tetracarboxylic dianhydride. It becomes [ the temperature at the time of junction of an adhesive film ] high that it is less than [ 70 mol % ] and is not desirable.

[0012] As a tetracarboxylic acid anhydride which can be used with the tetracarboxylic dianhydride of a formula (I) For example, pyromellitic acid 2 anhydride, 3, 3', 4, and 4'-diphenyl tetracarboxylic dianhydride, 2, 2', 3, and 3'-diphenyl tetracarboxylic dianhydride, 2, and 2-bis(3, 4-dicarboxy phenyl) propane 2 anhydride, 2 and 2-bis(2, 3-dicarboxy phenyl) propane 2 anhydride, 1 and 1-bis(2, 3-dicarboxy phenyl) ethane 2 anhydride, 1, and 1-bis(3, 4-dicarboxy phenyl) ethane 2 anhydride, Bis(2, 3-dicarboxy phenyl) methane 2 anhydride, bis(3, 4-dicarboxy phenyl) methane 2 anhydride, Bis(3, 4-dicarboxy phenyl) sulfone 2 anhydride, 3, 4 and 9, 10-perylene tetracarboxylic dianhydride, Bis(3, 4-dicarboxy phenyl) ether 2 anhydride, benzene - 1, 2, 3, 4-tetracarboxylic dianhydride, 3, 4, 3', and 4'-benzophenone tetracarboxylic dianhydride, 2 and 3, 2', 3-benzophenone tetracarboxylic dianhydride, 2, 3, 3', and 4'-benzophenone tetracarboxylic dianhydride, 1, 2 and 5, 6-naphthalene tetracarboxylic dianhydride, 2, 3, 6, 7-naphthalene tetracarboxylic dianhydride, 1, 2 and 4, 5-naphthalene-tetracarboxylic dianhydride, 1, 4 and 5, 8-naphthalene-tetracarboxylic dianhydride, [0013] 2, 6-dichloro naphthalene - 1, 4, 5, 8-tetracarboxylic dianhydride, 2, 7-dichloro naphthalene - 1, 4, 5, 8-tetracarboxylic dianhydride, 2, 3, 6, 7-tetra-KURORU naphthalene - 1, 4, 5, 8-tetracarboxylic dianhydride, Phenanthrene - 1, 8, 9, 10-tetracarboxylic dianhydride, pyrazine - 2, 3, 5, 6-tetracarboxylic dianhydride, Thiophene - 2, 3, 4, 5-tetracarboxylic dianhydride, 2 and 3, 3', and 4'-biphenyl tetracarboxylic dianhydride, 3, 4, 3', and 4'-biphenyl tetracarboxylic dianhydride, 2 and 3, 2', and 3'-biphenyl tetracarboxylic dianhydride, Bis(3, 4-dicarboxy phenyl) dimethylsilane 2 anhydride, bis(3, 4-dicarboxy phenyl) methylphenyl silane 2 anhydride, Bis(3, 4-dicarboxy phenyl) diphenyl silane 2 anhydride, 1, 4-bis(3, 4-dicarboxy phenyl dimethylsilyl) benzene 2 anhydride, 1, 3-screw (3, 4-dicarboxy phenyl) - 1, 1, 3, and 3-tetramethyl JISHIKURO hexane 2 anhydride, p-phenyl screw (trimellitic acid monoester acid anhydride), [0014] Ethylene tetracarboxylic dianhydride, 1, 2 and 3, 4-butane tetracarboxylic dianhydride, Decahydronaphthalene - 1, 4, 5, 8-tetracarboxylic dianhydride, 4, 8-dimethyl - 1, 2, 3, 5, 6, 7-hexahydro naphthalene - 1, 2, 5, 6-tetracarboxylic dianhydride, Cyclopentane - 1, 2, 3, 4-tetracarboxylic dianhydride, pyrrolidine - 2, 3, 4, 5-tetracarboxylic dianhydride, 1, 2, 3, 4-cyclobutane tetracarboxylic dianhydride, a bis(exo-bicyclo [2, 2, 1] heptane -2, 3-dicarboxylic acid anhydride) sulfone, Bicyclo -(2, 2, 2)- The oct (7)-ens 2, 3, and 5, 6-tetracarboxylic dianhydride, 2 and 2-bis(3, 4-dicarboxy phenyl) hexafluoropropane 2 anhydride, 2 and 2-screw [4-(3, 4-dicarboxy phenoxy) phenyl] hexafluoropropane 2 anhydride, 4 and 4'-bis(3, 4-dicarboxy phenoxy) diphenyl sulfide 2 anhydride, 1, a 4-bis(2-hydroxy hexafluoro isopropyl) benzene screw (trimellitic anhydride), 1, a 3-bis(2-hydroxy hexafluoro isopropyl) benzene screw (trimellitic anhydride), The 5-(2, 5-dioxotetrahydrofuryl)-3-methyl-3-cyclohexene -1, 2-dicarboxylic acid anhydride, tetrahydrofuran - There is 2, 3, 4, and 5-tetracarboxylic dianhydride etc., and two or more kinds may be mixed and used.

[0015] As diamine used by this invention, 1,2-diaminoethane, 1,3-diaminopropane, 1,4-diaminobutane, 1,5-diaminopentane, 1,6-diaminohexane, 1,7-diaminoheptane, 1,8-diaminooctane, 1,9-diaminononane, Aliphatic series diamines, such as 1,10-diaminodecane, 1,11-diaminoundecane, 1,12-diaminododecane, o-phenylenediamine, m-phenylenediamine, p-phenylenediamine, 3 and 3'-diaminodiphenyl ether, 3,4'-diaminodiphenyl ether, 4 and 4'-diaminodiphenyl ether, 3, and 3'-diaminodiphenylmethane, 3,4'-diaminodiphenylmethane, 4, and 4'-diaminodiphenylmethane, 3 and 3'-diaminodiphenyl difluoromethane, 3,4'-diaminodiphenyl difluoromethane, 4 and 4'-diaminodiphenyl difluoromethane, 3, and 3'-diaminodiphenyl sulfone, A 3,4'-diaminodiphenyl sulfone, 4, and 4'-diaminodiphenyl sulfone, 3, and 3'-diaminodiphenyl sulfide, 3,4'-diaminodiphenyl sulfide, 4, and 4'-diaminodiphenyl sulfide, [0016] 3 and 3'-diaminodiphenyl ketone, 3,4'-diaminodiphenyl ketone, A 4 and 4'-diaminodiphenyl ketone, 2, and 2-bis(3-aminophenyl)propane, A 2 and 2'-(3,4'-diaminodiphenyl)propane, 2, and 2-bis(4-aminophenyl)propane, 2 and 2-bis(3-aminophenyl)hexafluoropropane, 2, and 2-(3,4'-diaminodiphenyl)hexafluoropropane, 2 and 2-bis(4-aminophenyl)hexafluoropropane, 1,3-bis(3-amino phenoxy)benzene, 1,4-bis(3-amino phenoxy)benzene, 1,4-bis(4-amino phenoxy)benzene, A 3 and 3'-(1,4-phenylene screw (1-methylethylidene))bis-aniline, 3, a 4'-(1,4-phenylene screw (1-methylethylidene))bis-aniline, A 4 and 4'-(1,4-phenylene screw (1-methylethylidene))bis-aniline, A 2 and 2-bis(4-(3-amino phenoxy)phenyl)propane, A 2 and 2-bis(4-(4-amino phenoxy)phenyl)propane, 2 and 2-bis(4-(3-amino phenoxy)phenyl)hexafluoropropane, 2 and 2-bis(4-(4-amino phenoxy)phenyl)hexafluoropropane, A bis(4-(3-amino phenoxy)phenyl)sulfide, a bis(4-(4-amino phenoxy)phenyl)sulfide, A bis(4-(3-amino phenoxy)phenyl)sulfone, a bis(4-(4-amino phenoxy)phenyl)sulfone, 3 and 3'-dimethoxy-4,4'-diaminobiphenyl, and 4,4'-methylenebis(2,6-diethylaniline), An ortho tolidine sulfone, 1,4-bis(4-amino phenoxy)benzene, A 4 and 4-methylenebis(2,6-diisopropylaniline), 4, and 4'-bis(4-amino phenoxy)biphenyl, Aromatic series diamines, such as 1 and 1-bis(4-(4-amino phenoxy)phenyl)cyclohexane, 1, and 3-bis(3-aminopropyl)tetramethyl disiloxane, can be mentioned.

[0017] The condensation reaction of tetracarboxylic dianhydride and diamine is performed in an organic solvent. In this case, it is desirable to use tetracarboxylic dianhydride and diamine by equimolar mostly, and the addition sequence of each component has it. [arbitrary] As an organic solvent to be used, there are dimethylacetamide, dimethylformamide, a N-methyl-2-pyrrolidone, dimethyl sulfoxide, a hexamethyl phosphoramide, m-cresol, an o-KURORU phenol, etc.

[0018] 80 degrees C or less of reaction temperature are 0-50 degrees C preferably. The viscosity of reaction mixture rises gradually as a reaction advances. In this case, the polyamide acid which is the precursor of polyimide generates.

[0019] The dehydration ring closure of said reactant (polyamide acid) can be carried out, and polyimide resin can obtain it. A dehydration ring closure can be performed using the approach and the chemical approach of heat-treating at 120 degrees C - 250 degrees C. In the case of the approach of heat-treating at 120 degrees C - 250 degrees C, it is desirable to carry out removing the water produced in dehydration out of a system. Under the present circumstances, azeotropy removal of the water may be carried out using benzene, toluene, a xylene, etc.

[0020] When carrying out a dehydration ring closure by the chemical approach, carbodiimide compounds, such as an acid anhydride of an acetic anhydride, a propionic anhydride, and a benzoic anhydride and dicyclohexylcarbodiimide, etc. are used as a ring closure agent. At this time, ring closure catalysts, such as a pyridine, an isoquinoline, a trimethylamine, aminopyridine, and an imidazole, may be used if needed. As for a ring closure agent or a ring closure catalyst, it is desirable to use it in 1-8 mols to one mol of tetracarboxylic dianhydride, respectively.

[0021] Moreover, a silane coupling agent, a titanium system coupling agent, the Nonion system surfactant, a fluorochemical surfactant, a silicone system additive, etc. may be suitably added to the adhesive film of this invention if needed.

[0022] It is made for manufacture of the adhesive film of this invention to be the following. An epoxy resin, phenol resin, and polyimide system resin are first dissolved in an organic solvent. If the organic solvent used here can dissolve or knead the above-mentioned ingredient to homogeneity, there will be

especially no limit and dimethylformamide, dimethylacetamide, N-methyl pyrrolidone, dimethyl sulfoxide, diethylene-glycol wood ether, toluene, benzene, a xylene, a methyl ethyl ketone, a tetrahydrofuran, ethylcellosolve, ethylcellosolve acetate, butyl cellosolve, dioxane, etc. will be mentioned as such a thing.

[0023] Subsequently, a hardening accelerator, a mineral matter filler, and if needed, an additive is added and it mixes. In this case, you may knead, combining suitably dispersers, such as the usual agitator, a stone milling machine, 3 rolls, and a ball mill.

[0024] in this way, the conditions on which the solvent which applied and used the obtained paste-like mixture for homogeneity on base films, such as for example, a sheet made from a propylene, fully vaporizes -- that is, in general, at the temperature of 60-200 degrees C, it heats for 0.1 - 30 minutes, and an adhesive film is obtained.

[0025] The adhesive film obtained by this invention is used for adhesion of the supporter material of the leadframe of semiconductor devices, such as IC and LSI, a ceramic patchboard, a glass epoxy patchboard, and a glass polyimide patchboard.

[0026] The adhesive film of this invention can be pasted up by the following approaches, when pasting up a semiconductor device and leadframes, such as IC and LSI.

[0027] There is the approach of forming an adhesive film in the shape of a tape ribbon, cutting this according to the magnitude of a semiconductor device, putting between a leadframe and a semiconductor device, and carrying out heating adhesion in the first place. When pasting up by this approach, it can be made to paste up with the equipment adapting the die bonding equipment for for example, solder ribbons etc.

[0028] The adhesive film is first formed [ second ] in the leadframe, and there is the approach of carrying out heating adhesion of the semiconductor device next. In order to form an adhesive film in a leadframe, there is a method of applying and sticking the approach or solvent which cuts, heats and sticks an adhesive film according to the magnitude of a semiconductor device etc. Moreover, the varnish of an adhesive film can also be made to form by the approach of carrying out printing spreading on a leadframe. After forming an adhesive film in a leadframe, in order to paste up a semiconductor device, it can be made to paste up conventionally with the equipment adapting the die bonding equipment used with a silver paste.

[0029] The adhesive film is formed [ third ] in the wafer side, then, a wafer and an adhesive film are cut at a dicing process, and there is the approach of pasting up on a leadframe. In order to form an adhesive film in a wafer side, there is a method of applying and sticking the approach or solvent which heats and sticks an adhesive film etc. Moreover, the varnish of an adhesive film can also be made to form in a wafer side by the approach of carrying out printing spreading or a spin coat. After forming an adhesive film in a wafer side, in order to paste up a semiconductor device, it can be made to paste up conventionally with the equipment adapting the die bonding equipment used with a silver paste.

[0030] Although there is the approach of cutting a semiconductor device and an adhesive film at a dicing process, and sticking at a leadframe on the adhesive dicing film used at the dicing process other than the above-mentioned approach, after making the adhesive film form and sticking a wafer on this etc., the adhesive film of this invention is not limited to which approach illustrated above.

[0031]

[Example] Hereafter, this invention is explained using an example.

2 and 2-bis(4-(4-amino phenoxy) phenyl) propane 41g (0.1 mols) and dimethylacetamide 150g were taken and stirred in the 500ml 4 opening flask equipped with synthetic example 1 thermometer, an agitator, and calcium chloride tubing. 41g (0.1 mols) of ethylene screw trimellitate 2 anhydrides was added small quantity every after the dissolution of diamine, cooling a flask in an ice bath. After making it react at a room temperature for 3 hours, xylene 30g is added and it is N<sub>2</sub>. It heated at 150 degrees C, blowing gas, and azeotropy removal of the xylene was carried out with water. The reaction mixture was poured out underwater, the polymer which precipitated was taken by filtration, it dried and Polyimide A was obtained.

[0032] 4 and 4'-methylenebis (2, 6-diisopropyl aniline)g [ 32.94 ] (0.09 mols) and 1 and 3-bis(3-



aminopropyl) tetramethyl disiloxane 2.48g (0.01 mols) and 150g of N-methyl-2-pyrrolidones were taken and stirred in the 500ml 4 opening flask equipped with synthetic example 2 thermometer, an agitator, and calcium chloride tubing. 43.8g (0.1 mols) of tetra-methylenebis trimellitate 2 anhydrides was added at the room temperature after the dissolution of diamine. It was made to react below 5 degrees C for 5 hours, 20.4g [ of acetic anhydrides ] (0.2 mols) and pyridine 15.8g (0.2 mols) was added, and it stirred at the room temperature for 1 hour. This reaction mixture was poured out underwater, the polymer which precipitated was taken by filtration, it dried and Polyimide B was obtained.

[0033] It is 2 and 2-bis(4-amino phenoxyphenyl) propanesg [ 32.8 ] (0.08 mols) and 3, 3', 5, and 5'-tetramethyl to the 500ml 4 opening flask equipped with synthetic example 3 thermometer, an agitator, and calcium chloride tubing. - 4 and 4'-diamino diphenylmethane 5.08g (0.02 mols) and dimethylacetamide 100g were taken and stirred. 41.8g (0.08 mols) of deca methylenebis trimellitate 2 anhydrides and 6.44g (0.02 mols) of benzophenone tetracarboxylic dianhydride were added small quantity every after the dissolution of diamine, cooling a flask in an ice bath. After addition termination, after making it react at a room temperature further in an ice bath for 4 hours for 3 hours, 25.5g [ of acetic anhydrides ] (0.25 mols) and pyridine 19.8g (0.25 mols) was added, and it stirred at the room temperature for 2 hours. The reaction mixture was poured out underwater, the polymer which precipitated was taken by filtration, it dried and Polyimide C was obtained.

[0034] The varnish of No.1-7 (the example of this invention: No.1-5, example:No.of comparison6-7) was prepared as shown in the recipe of one to example 5 table 1. In addition, in Table 1, various notations mean the following.

YDCH-702: Tohto Kasei, cresol novolak mold epoxy (weight per epoxy equivalent 220)

N-865 : the Dainippon Ink make, bisphenol novolak mold epoxy (weight per epoxy equivalent 208)

ESCN-195: Sumitomo Chemical, cresol novolak mold epoxy (weight per epoxy equivalent 200)

H-1 : Meiwa Chemicals, a phenol novolak (OH equivalent 106)

VH-4170 : Dainippon Ink, the bisphenol A novolak (OH equivalent 118)

[0035]

[Table 1]

Table 1 Recipe (unit: weight section)

No.1 2 3 4 5 6 7										Polyimide A B C A A - A			
100	100	100	100	100	100	100	100	100	100	Epoxy resin YDCN-702 N-865 ESCN-195 N-			
865	N-865	YDCN-702-	The 50 sections	The 20 sections	The ten sections	The ten sections	The 100 sections	The 100 sections	-	FENO H-1H-1VH-4170 VH-4170 VH-4170			
H-1	-RU	resin 24	10-5-9	5.6	70	48	-	-	-	Promotion of hardening 2P4MHZ			

TPPK 2MA-0K TPPK TPPK 2P4MHZ - agent 0.5 0.4 0.1 0.5 10 1 -

Mineral matter Silica Silica Silica Alumina Alumina Silica Silica filler 80 45 18 100 190180 180

\*\* Intermediation DMAC NMP DMF DMFDMF DMAC DMAC 400200 100

100 1000 1000 The notation in 500-----, however Table 1 is following semantics.

DMAC: Dimethylacetamide NMP : N-methyl pyrrolidone DMF : The varnish of dimethylformamide \*\* was applied to the thickness of 30-50 micrometers on the polypropylene film, and it heated at 120 degrees C continuously by 80 degrees C for 30 minutes for 10 minutes, and the adhesive film was obtained.

[0036] Next, the adhesive strength of the obtained adhesive film was examined. The adhesive film was cut in magnitude of 4x4mm, this was inserted between the 4x4mm silicon chip and 42 alloy leadframe with silver plating, the 1000g load was applied, and 260 degrees C of adhesive strength were measured for shear adhesive strength using the push pull gage at the time of a room temperature and the heat 20 seconds after 350-degree-C heating, after making it stuck by pressure for 3 seconds (Table 2).

[0037]

[Table 2]

Table 2 Adhesive strength ----- of film moldability of paste, and adhesive film

\*1 No.1 2 3 4 5 6 (comparison) 7 (comparison)

----- Adhesive strength Room temperature 10.7 11.0 11.5 10.3 14.0 - 11.0  
(kg/chip) ----- 350 \*\* 2.2 2.4 3.2 2.0 2.3 - 0.4 ----- \*1 For  
the \*\*\*\* reason, it did not become film-like, and adhesive strength was not able to be measured.  
[0038]

[Effect of the Invention] Since the adhesive film of this invention is thermosetting, it is excellent in the adhesive property at the time of heat. If the adhesive film of this invention is used, it is possible to prepare an adhesives layer in the large-sized chip of IC or LSI at homogeneity.

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[Translation done.]

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PRIOR ART

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[Description of the Prior Art] Conventionally, an Au-Si eutectic alloy, solder, or a silver paste is used for junction of IC, LSI, and a leadframe. Although thermal resistance and moisture resistance are high, an Au-Si eutectic alloy tends to break, when it applies to a large-sized chip, since the modulus of elasticity is large, and also has an expensive difficulty. Although solder is cheap, thermal resistance is inferior, and a modulus of elasticity is high like an Au-Si eutectic alloy, and still more difficult to apply to a large-sized chip. On the other hand, a modulus of elasticity is also the lowest in the three above-mentioned person, and since it also has thermal resistance applicable to a 350-degree C thermocompression bonding mold wire bonder, the charge of junction material of current IC and LSI, and a leadframe is in use [ a silver paste is cheap, and / moisture resistance is high, and ]. However, when it is going to join a leadframe to IC or LSI with a silver paste while high integration of IC or LSI progresses in recent years and the chip is enlarged in connection with it, difficulty is followed on opening a silver paste all over a chip and applying.

[0003] micro electro nick Manufacture ring and -- The adhesive film for die bond which filled up thermoplastics with filler metal at testing (MICROELECTRONIC MANUFACTURING AND TESTING June, 1988, 9 pages) was indicated. To near the melting point of thermoplastics, this raises temperature and carries out pressurization junction.

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EFFECT OF THE INVENTION

---

[Effect of the Invention] Since the adhesive film of this invention is thermosetting, it is excellent in the adhesive property at the time of heat. If the adhesive film of this invention is used, it is possible to prepare an adhesives layer in the large-sized chip of IC or LSI at homogeneity.

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TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] If thermoplastics with the low melting point is used for the adhesive film indicated by the above-mentioned magazine, the damage given to chips, such as oxidization of a leadframe, by becoming low will have little virtual junction temperature, and it will end. However, since thermal resistance is low, heat treatment after die bond, for example, wire bond, a closure process, etc. cannot be borne. When thermoplastics with the high melting point is used so that it can be equal to such heat treatment, virtual junction temperature becomes high and there is a problem which receives damages, such as oxidization of a leadframe. This invention aims at offering the adhesive film for die BONTO which can perform comparatively heat treatment at the time of die bond at low temperature like the conventional silver paste.

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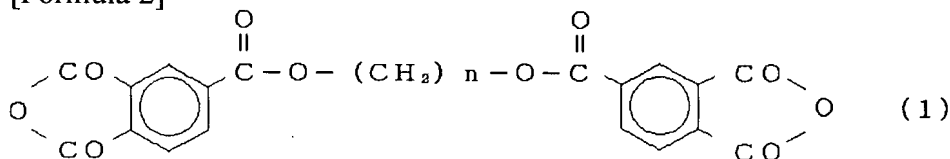
## MEANS

[Means for Solving the Problem] This invention relates to following (1) - (3).

(1)

(A) Next \*\* 2 [a formula (I)]

[Formula 2]



(-- however, the integer of  $n=2-20$  is shown.) -- the tetracarboxylic dianhydride expressed -- all acid 2 anhydride -- receiving -- more than 70 mol % -- polyimide system resin; which diamine is made to react to the tetracarboxylic dianhydride contained, and is obtained

(B) Epoxy resin;

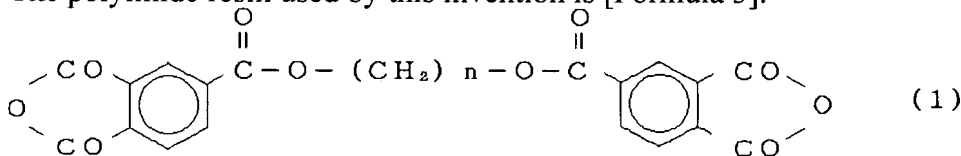
(C) Phenol resin;

(D) The adhesive film which comes to contain hardening-accelerator; and (E) mineral matter filler.

(2) -- the tetracarboxylic dianhydride expressed with the (A) type (I) -- all acid 2 anhydride -- receiving - more than 70 mol % -- to the tetracarboxylic dianhydride contained Polyimide system resin and (B) epoxy resin; and (C) phenol resin; which diamine is made to react and are obtained are dissolved in an organic solvent. The manufacturing method of the adhesive film characterized by heating after adding (D) hardening-accelerator; and (E) mineral matter filler to this, mixing and applying on a base film.

(3) The method of pasting up the semiconductor device and supporter material which sandwich the adhesive film of the above (1) between a semiconductor device and supporter material, and carry out heating sticking by pressure.

The polyimide resin used by this invention is [Formula 3].



(-- however, the integer of  $n=2-20$  is shown.) -- the tetracarboxylic dianhydride expressed -- all acid 2 anhydride -- receiving -- more than 70 mol % -- polyimide system resin \*\* which diamine is made to react to the tetracarboxylic dianhydride contained, and is obtained is used.

[0006] As for the epoxy resin (B) used by this invention, the epoxy resin of the glycidyl ether mold of a phenol is preferably used for intramolecular from the point of hardenability or a hardened material property including at least two epoxy groups. As such resin, bisphenol A, bisphenol A D, Bisphenol S, Bisphenol F or the condensate of halogenation bisphenol A and epichlorohydrin, the glycidyl ether of phenol novolak resin, the glycidyl ether of cresol novolak resin, the glycidyl ether of bisphenol A novolak resin, etc. are mentioned. the amount of an epoxy resin -- the polyimide resin 100 weight

section -- receiving -- the 1 - 200 weight section -- if preferably fewer in the range of the 5 - 100 weight section than this, an adhesive property will worsen, and a film plasticity is inferior when many.

[0007] The phenol resin (C) used by this invention has at least two phenolic hydroxyl groups in a molecule, and for example, phenol novolak resin, cresol novolak resin, bisphenol A novolak resin, a Poly p-vinyl phenol, phenol aralkyl resin, etc. are mentioned as such resin. the amount of phenol resin - the epoxy resin 100 weight section -- receiving -- the 2 - 150 weight section -- it is the range of the 50 - 120 weight section preferably, and even if [ than this ] more, hardenability becomes inadequate at least.

[0008] If the hardening accelerator (D) used by this invention is used in order to stiffen an epoxy resin, especially a limit will not have it. As such a thing, imidazole-derivatives, dicyandiamide derivative, dicarboxylic acid dihydrazide, triphenyl phosphine, tetra-phenyl phosphonium tetraphenylborate, 2-ethyl-4-methylimidazole-tetraphenyl borate, 1, and 8-diazabicyclo (5, 4, 0) undecene-7-tetraphenyl borate etc. is used. These may use two or more sorts together. the amount of a hardening accelerator -- the epoxy resin 100 weight section -- receiving -- 0.01 - 50 weight section -- it is the range of 0.1 - 20 weight section preferably, if fewer than this, hardenability will become inadequate, and if many, preservation stability will worsen.

[0009] it is added in order to give low-feeve expansibility and low moisture absorption to adhesives, and the mineral matter filler (E) used by this invention is independent in inorganic insulators, such as a silica, an alumina, a titania, glass, an iron oxide, and a ceramic, -- or two or more sorts are mixed and it uses. the amount of a mineral matter filler -- the polyimide resin 100 weight section -- receiving -- the 1 - 8000 weight section -- it is the range of the 50 - 4000 weight section preferably. If fewer than this, sufficient low-feeve expansibility and low hygroscopicity will not be acquired, but if [ than this ] more, an adhesive property will fall.

[0010] As tetracarboxylic dianhydride which is used by this invention and which is expressed with a formula (I) Ethylene screw trimellitate 2 anhydride, trimethylene screw trimellitate 2 anhydride, Tetramethylenebis trimellitate 2 anhydride, pentamethylene screw trimellitate 2 anhydride, Hexamethylenebis trimellitate 2 anhydride, hepta-methylenebis trimellitate 2 anhydride, Octamethylene screw trimellitate 2 anhydride, nonamethylene screw trimellitate 2 anhydride, There are deca methylenebis trimellitate 2 anhydride, dodeca methylenebis trimellitate 2 anhydride, hexadecamethylene screw trimellitate 2 anhydride, OKUTA deca methylenebis trimellitate 2 anhydride, etc., and two or more sorts may be used together.

[0011] These tetracarboxylic dianhydride is compoundable from trimellitic anhydride mono-chloride and corresponding diol. The above-mentioned tetracarboxylic dianhydride contains more than 70 mol % to all tetracarboxylic dianhydride. It becomes [ the temperature at the time of junction of an adhesive film ] high that it is less than [ 70 mol % ] and is not desirable.

[0012] As a tetracarboxylic acid anhydride which can be used with the tetracarboxylic dianhydride of a formula (I) For example, pyromellitic acid 2 anhydride, 3, 3', 4, and 4'-diphenyl tetracarboxylic dianhydride, 2, 2', 3, and 3'-diphenyl tetracarboxylic dianhydride, 2, and 2-bis(3, 4-dicarboxy phenyl) propane 2 anhydride, 2 and 2-bis(2, 3-dicarboxy phenyl) propane 2 anhydride, 1 and 1-bis(2, 3-dicarboxy phenyl) ethane 2 anhydride, 1, and 1-bis(3, 4-dicarboxy phenyl) ethane 2 anhydride, Bis(2, 3-dicarboxy phenyl) methane 2 anhydride, bis(3, 4-dicarboxy phenyl) methane 2 anhydride, Bis(3, 4-dicarboxy phenyl) sulfone 2 anhydride, 3, 4 and 9, 10-perylene tetracarboxylic dianhydride, Bis(3, 4-dicarboxy phenyl) ether 2 anhydride, benzene - 1, 2, 3, 4-tetracarboxylic dianhydride, 3, 4, 3', and 4'-benzophenone tetracarboxylic dianhydride, 2 and 3, 2', 3-benzophenone tetracarboxylic dianhydride, 2, 3, 3', and 4'-benzophenone tetracarboxylic dianhydride, 1, 2 and 5, 6-naphthalene tetracarboxylic dianhydride, 2, 3, 6, 7-naphthalene tetracarboxylic dianhydride, 1, 2 and 4, 5-naphthalene-tetracarboxylic dianhydride, 1, 4 and 5, 8-naphthalene-tetracarboxylic dianhydride, [0013] 2, 6-dichloro naphthalene - 1, 4, 5, 8-tetracarboxylic dianhydride, 2, 7-dichloro naphthalene - 1, 4, 5, 8-tetracarboxylic dianhydride, 2, 3, 6, 7-tetra-KURORU naphthalene - 1, 4, 5, 8-tetracarboxylic dianhydride, Phenanthrene - 1, 8, 9, 10-tetracarboxylic dianhydride, pyrazine - 2, 3, 5, 6-tetracarboxylic dianhydride, Thiophene - 2, 3, 4, 5-tetracarboxylic dianhydride, 2 and 3, 3', and 4'-biphenyl tetracarboxylic dianhydride, 3, 4, 3', and 4'-biphenyl tetracarboxylic dianhydride, 2 and 3, 2', and 3'-biphenyl

tetracarboxylic dianhydride, Bis(3, 4-dicarboxy phenyl) dimethylsilane 2 anhydride, bis(3, 4-dicarboxy phenyl) methylphenyl silane 2 anhydride, Bis(3, 4-dicarboxy phenyl) diphenyl silane 2 anhydride, 1, 4-bis(3, 4-dicarboxy phenyl dimethylsilyl) benzene 2 anhydride, 1, 3-screw (3, 4-dicarboxy phenyl) - 1, 1, 3, and 3-tetramethyl JISHIKURO hexane 2 anhydride, p-phenyl screw (trimellitic acid monoester acid anhydride), [0014] Ethylene tetracarboxylic dianhydride, 1, 2 and 3, 4-butane tetracarboxylic dianhydride, Decahydronaphthalene - 1, 4, 5, 8-tetracarboxylic dianhydride, 4, 8-dimethyl - 1, 2, 3, 5, 6, 7-hexahydro naphthalene - 1, 2, 5, 6-tetracarboxylic dianhydride, Cyclopentane - 1, 2, 3, 4-tetracarboxylic dianhydride, pyrrolidine - 2, 3, 4, 5-tetracarboxylic dianhydride, 1, 2, 3, 4-cyclobutane tetracarboxylic dianhydride, a bis(exo-bicyclo [2, 2, 1] heptane -2, 3-dicarboxylic acid anhydride) sulfone, Bicyclo -(2, 2, 2)- The oct (7)-ens 2, 3, and 5, 6-tetracarboxylic dianhydride, 2 and 2-bis(3, 4-dicarboxy phenyl) hexafluoropropane 2 anhydride, 2 and 2-screw [4-(3, 4-dicarboxy phenoxy) phenyl] hexafluoropropane 2 anhydride, 4 and 4'-bis(3, 4-dicarboxy phenoxy) diphenyl sulfide 2 anhydride, 1, a 4-bis(2-hydroxy hexafluoro isopropyl) benzene screw (trimellitic anhydride), 1, a 3-bis(2-hydroxy hexafluoro isopropyl) benzene screw (trimellitic anhydride), The 5-(2, 5-dioxotetrahydrofuryl)-3-methyl-3-cyclohexene -1, 2-dicarboxylic acid anhydride, tetrahydrofuran - There is 2, 3, 4, and 5-tetracarboxylic dianhydride etc., and two or more kinds may be mixed and used.

[0015] As diamine used by this invention, 1,2-diaminoethane, 1, 3-diaminopropane, 1,4-diaminobutane, 1,5-diaminopentane, 1, 6-diaminohexan, 1, 7-diamino heptane, 1, 8-diamino octane, 1, 9-diamino nonane, Aliphatic series diamines, such as 1, 10-diamino decane, 1, and 11-diamino undecane, 1, and 12-diamino dodecane, o-phenylenediamine, m-phenylenediamine, p-phenylene diamine, 3 and 3'-diamino diphenyl ether, 3, 4'-diamino diphenyl ether, 4 and 4'-diamino diphenyl ether, 3, and 3'-diamino diphenylmethane, 3, 4'-diamino diphenylmethane, 4, and 4'-diamino diphenylmethane, 3 and 3'-diamino diphenyl difluoromethane, 3, 4'-diamino diphenyl difluoromethane, 4 and 4'-diamino diphenyl difluoromethane, 3, and 3'-diaminodiphenyl sulfone, A 3, 4'-diaminodiphenyl sulfone, 4, and 4'-diaminodiphenyl sulfone, 3, and 3'-diamino diphenyl sulfide, 3, 4'-diamino diphenyl sulfide, 4, and 4'-diamino diphenyl sulfide, [0016] 3 and 3'-diamino diphenyl ketone, 3, 4'-diamino diphenyl ketone, A 4 and 4'-diamino diphenyl ketone, 2, and 2-bis(3-aminophenyl) propane, A 2 and 2'-(3, 4'-diamino diphenyl) propane, 2, and 2-bis(4-aminophenyl) propane, 2 and 2-bis(3-aminophenyl) hexafluoropropane, 2, and 2-(3, 4'-diamino diphenyl) hexafluoropropane, 2 and 2-bis(4-aminophenyl) hexafluoropropane, 1, 3-bis(3-amino phenoxy) benzene, 1, 4-bis(3-amino phenoxy) benzene, 1, 4-bis(4-amino phenoxy) benzene, A 3 and 3'-(1, 4-phenylene screw (1-methylethylidene)) bis-aniline, 3, a 4'-(1, 4-phenylene screw (1-methylethylidene)) bis-aniline, A 4 and 4'-(1, 4-phenylene screw (1-methylethylidene)) bis-aniline, A 2 and 2-bis(4-(3-amino phenoxy) phenyl) propane, A 2 and 2-bis(4-(4-amino phenoxy) phenyl) propane, 2 and 2-bis(4-(3-amino phenoxy) phenyl) hexafluoropropane, 2 and 2-bis(4-(4-amino phenoxy) phenyl) hexafluoropropane, A bis(4-(3-amino phenoxy) phenyl) sulfide, a bis(4-(4-amino phenoxy) phenyl) sulfide, A bis(4-(3-amino phenoxy) phenyl) sulfone, a bis(4-(4-amino phenoxy) phenyl) sulfone, 3 and 3'-dimethoxy -4, - diamino biphenyl, and 4 '4, 4'-methylenebis (2, 6-diethylaniline), An ortho tolidine sulfone, 1, 4-bis(4-amino phenoxy) benzene, A 4 and 4-methylenebis (2, 6-diisopropyl aniline), 4, and 4'-bis(4-amino phenoxy) biphenyl, Aromatic series diamines, such as 1 and 1-bis(4-(4-amino phenoxy) phenyl) cyclohexane, 1, and 3-bis(3-aminopropyl) tetramethyl disiloxane, can be mentioned.

[0017] The condensation reaction of tetracarboxylic dianhydride and diamine is performed in an organic solvent. In this case, it is desirable equimolar or to use tetracarboxylic dianhydride and diamine by equimolar mostly, and the addition sequence of each component has it. [ arbitrary ] As an organic solvent to be used, there are dimethylacetamide, dimethylformamide, a N-methyl-2-pyrrolidone, dimethyl sulfoxide, a hexamethyl phosphoryl amide, m-cresol, an o-KURORU phenol, etc.

[0018] 80 degrees C or less of reaction temperature are 0-50 degrees C preferably. The viscosity of reaction mixture rises gradually as a reaction advances. In this case, the polyamide acid which is the precursor of polyimide generates.

[0019] The dehydration ring closure of said reactant (polyamide acid) can be carried out, and polyimide resin can obtain it. A dehydration ring closure can be performed using the approach and the chemical



approach of heat-treating at 120 degrees C - 250 degrees C. In the case of the approach of heat-treating at 120 degrees C - 250 degrees C, it is desirable to carry out removing the water produced in dehydration out of a system. Under the present circumstances, azeotropy removal of the water may be carried out using benzene, toluene, a xylene, etc.

[0020] When carrying out a dehydration ring closure by the chemical approach, carbodiimide compounds, such as an acid anhydride of an acetic anhydride, a propionic anhydride, and a benzoic anhydride and dicyclohexylcarbodiimide, etc. are used as a ring closure agent. At this time, ring closure catalysts, such as a pyridine, an isoquinoline, a trimethylamine, aminopyridine, and an imidazole, may be used if needed. As for a ring closure agent or a ring closure catalyst, it is desirable to use it in 1-8 mols to one mol of tetracarboxylic dianhydride, respectively.

[0021] Moreover, a silane coupling agent, a titanium system coupling agent, the Nonion system surfactant, a fluorochemical surfactant, a silicone system additive, etc. may be suitably added to the adhesive film of this invention if needed.

[0022] It is made for manufacture of the adhesive film of this invention to be the following. An epoxy resin, phenol resin, and polyimide system resin are first dissolved in an organic solvent. If the organic solvent used here can dissolve or knead the above-mentioned ingredient to homogeneity, there will be especially no limit and dimethylformamide, dimethylacetamide, N-methyl pyrrolidone, dimethyl sulfoxide, diethylene-glycol wood ether, toluene, benzene, a xylene, a methyl ethyl ketone, a tetrahydrofuran, ethylcellosolve, ethylcellosolve acetate, butyl cellosolve, dioxane, etc. will be mentioned as such a thing.

[0023] Subsequently, a hardening accelerator, a mineral matter filler, and if needed, an additive is added and it mixes. In this case, you may knead, combining suitably dispersers, such as the usual agitator, a stone milling machine, 3 rolls, and a ball mill.

[0024] in this way, the conditions on which the solvent which applied and used the obtained paste-like mixture for homogeneity on base films, such as for example, a sheet made from a propylene, fully vaporizes -- that is, in general, at the temperature of 60-200 degrees C, it heats for 0.1 - 30 minutes, and an adhesive film is obtained.

[0025] The adhesive film obtained by this invention is used for adhesion of the supporter material of the leadframe of semiconductor devices, such as IC and LSI, a ceramic patchboard, a glass epoxy patchboard, and a glass polyimide patchboard.

[0026] The adhesive film of this invention can be pasted up by the following approaches, when pasting up a semiconductor device and leadframes, such as IC and LSI.

[0027] There is the approach of forming an adhesive film in the shape of a tape ribbon, cutting this according to the magnitude of a semiconductor device, putting between a leadframe and a semiconductor device, and carrying out heating adhesion in the first place. When pasting up by this approach, it can be made to paste up with the equipment adapting the die bonding equipment for for example, solder ribbons etc.

[0028] The adhesive film is first formed [ second ] in the leadframe, and there is the approach of carrying out heating adhesion of the semiconductor device next. In order to form an adhesive film in a leadframe, there is a method of applying and sticking the approach or solvent which cuts, heats and sticks an adhesive film according to the magnitude of a semiconductor device etc. Moreover, the varnish of an adhesive film can also be made to form by the approach of carrying out printing spreading on a leadframe. After forming an adhesive film in a leadframe, in order to paste up a semiconductor device, it can be made to paste up conventionally with the equipment adapting the die bonding equipment used with a silver paste.

[0029] The adhesive film is formed [ third ] in the wafer side, then, a wafer and an adhesive film are cut at a dicing process, and there is the approach of pasting up on a leadframe. In order to form an adhesive film in a wafer side, there is a method of applying and sticking the approach or solvent which heats and sticks an adhesive film etc. Moreover, the varnish of an adhesive film can also be made to form in a wafer side by the approach of carrying out printing spreading or a spin coat. After forming an adhesive film in a wafer side, in order to paste up a semiconductor device, it can be made to paste up

conventionally with the equipment adapting the die bonding equipment used with a silver paste.  
[0030] Although there is the approach of cutting a semiconductor device and an adhesive film at a dicing process, and sticking at a leadframe on the adhesive dicing film used at the dicing process other than the above-mentioned approach, after making the adhesive film form and sticking a wafer on this etc., the adhesive film of this invention is not limited to which approach illustrated above.

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EXAMPLE

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[Example] Hereafter, this invention is explained using an example.

2 and 2-bis(4-(4-amino phenoxy) phenyl) propane 41g (0.1 mols) and dimethylacetamide 150g were taken and stirred in the 500ml 4 opening flask equipped with synthetic example 1 thermometer, an agitator, and calcium chloride tubing. 41g (0.1 mols) of ethylene screw trimellitate 2 anhydrides was added small quantity every after the dissolution of diamine, cooling a flask in an ice bath. After making it react at a room temperature for 3 hours, xylene 30g is added and it is N<sub>2</sub>. It heated at 150 degrees C, blowing gas, and azeotropy removal of the xylene was carried out with water. The reaction mixture was poured out underwater, the polymer which precipitated was taken by filtration, it dried and Polyimide A was obtained.

[0032] 4 and 4'-methylenebis (2, 6-diisopropyl aniline)g [ 32.94 ] (0.09 mols) and 1 and 3-bis(3-aminopropyl) tetramethyl disiloxane 2.48g (0.01 mols) and 150g of N-methyl-2-pyrrolidones were taken and stirred in the 500ml 4 opening flask equipped with synthetic example 2 thermometer, an agitator, and calcium chloride tubing. 43.8g (0.1 mols) of tetra-methylenebis trimellitate 2 anhydrides was added at the room temperature after the dissolution of diamine. It was made to react below 5 degrees C for 5 hours, 20.4g [ of acetic anhydrides ] (0.2 mols) and pyridine 15.8g (0.2 mols) was added, and it stirred at the room temperature for 1 hour. This reaction mixture was poured out underwater, the polymer which precipitated was taken by filtration, it dried and Polyimide B was obtained.

[0033] It is 2 and 2-bis(4-amino phenoxyphenyl) propanesg [ 32.8 ] (0.08 mols) and 3, 3', 5, and 5'-tetramethyl to the 500ml 4 opening flask equipped with synthetic example 3 thermometer, an agitator, and calcium chloride tubing. - 4 and 4'-diamino diphenylmethane 5.08g (0.02 mols) and dimethylacetamide 100g were taken and stirred. 41.8g (0.08 mols) of deca methylenebis trimellitate 2 anhydrides and 6.44g (0.02 mols) of benzophenone tetracarboxylic dianhydride were added small quantity every after the dissolution of diamine, cooling a flask in an ice bath. After addition termination, after making it react at a room temperature further in an ice bath for 4 hours for 3 hours, 25.5g [ of acetic anhydrides ] (0.25 mols) and pyridine 19.8g (0.25 mols) was added, and it stirred at the room temperature for 2 hours. The reaction mixture was poured out underwater, the polymer which precipitated was taken by filtration, it dried and Polyimide C was obtained.

[0034] The varnish of No.1-7 (the example of this invention: No.1-5, example:No.of comparison6-7) was prepared as shown in the recipe of one to example 5 table 1. In addition, in Table 1, various notations mean the following.

YDCH-702: Tohto Kasei, cresol novolak mold epoxy (weight per epoxy equivalent 220)

N-865 : the Dainippon Ink make, bisphenol novolak mold epoxy (weight per epoxy equivalent 208)

ESCN-195: Sumitomo Chemical, cresol novolak mold epoxy (weight per epoxy equivalent 200)

H-1 : Meiwa Chemicals, a phenol novolak (OH equivalent 106)

VH-4170 : Dainippon Ink, the bisphenol A novolak (OH equivalent 118)

[0035]

[Table 1]

Table 1 Recipe (unit: weight section)

----- No.1 2 3 4 5 6 7 ----- Polyimide A B C A A - A  
 100 100 100 100 100 100 ----- Epoxy resin YDCN-702 N-865 ESCN-195 N-  
 865 N-865 YDCN-702- The 50 sections The 20 sections The ten sections The ten sections The 100  
 sections The 100 sections - ----- FENO H-1H-1VH-4170 VH-4170 VH-4170  
 H-1 - RU resin 24 10 5.9 5.6 70 48 - ----- Promotion of hardening 2P4MHZ  
 TPPK 2MA-0K TPPK TPPK 2P4MHZ - agent 0.5 0.4 0.1 0.5 10 1 - -----  
 Mineral matter Silica Silica Silica Alumina Alumina Silica Silica filler 80 45 18 100 190180 180 -----  
 ----- \*\* Intermediation DMAC NMP DMF DMFDMF DMAC DMAC 400200 100  
 100 1000 1000 The notation in 500-----, however Table 1 is following  
 semantics.

DMAC: Dimethylacetamide NMP : N-methyl pyrrolidone DMF : The varnish of dimethylformamide \*\*  
 was applied to the thickness of 30-50 micrometers on the polypropylene film, and it heated at 120  
 degrees C continuously by 80 degrees C for 30 minutes for 10 minutes, and the adhesive film was  
 obtained.

[0036] Next, the adhesive strength of the obtained adhesive film was examined. The adhesive film was  
 cut in magnitude of 4x4mm, this was inserted between the 4x4mm silicon chip and 42 alloy leadframe  
 with silver plating, the 1000g load was applied, and 260 degrees C of adhesive strength were measured  
 for shear adhesive strength using the push pull gage at the time of a room temperature and the heat 20  
 seconds after 350-degree-C heating, after making it stuck by pressure for 3 seconds (Table 2).

[0037]

[Table 2]

Table 2 Adhesive strength ----- of film moldability of paste, and adhesive film  
 \*1 No.1 2 3 4 5 6(comparison) 7 (comparison)

----- Adhesive strength Room temperature 10.7 11.0 11.5 10.3 14.0 - 11.0  
 (kg/chip) ----- 350 \*\* 2.2 2.4 3.2 2.0 2.3 - 0.4 ----- \*1 For  
 the \*\*\*\* reason, it did not become film-like, and adhesive strength was not able to be measured.

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[Translation done.]